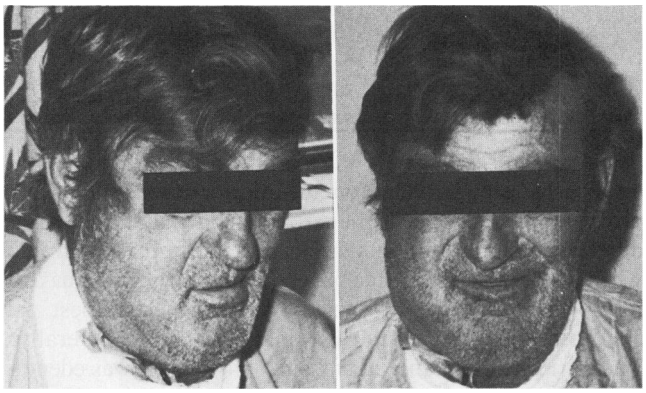

Figure 1.—The patient three days after surgical drainage. **Left,** view from right side; **right,** frontal view.

respiratory tract symptom of dry cough, subsequent development of a facial cellulitis with bacteremia with *S equi* and spread of pus along fascial planes to the suprasternal notch as well as induration of the skin of his chest and abdomen to the level of the inguinal ligament are strikingly similar to the syndrome that occurs in horses and, as such, may represent the first described case of "human strangles."

Of interest also is the initial evidence (and subsequent resolution) of renal disease reflected by microscopic hematuria, pyuria and proteinuria in the presence of a rising creatinine level. The development of poststreptococcal glomerulonephritis has been associated with infections with another group C *Streptococcus, Streptococcus zooepidemicus.*[8] In this case the initial respiratory tract infection two weeks previously may have served as an immunologic stimulus for the development of nephritis. *S equi* does not produce streptolysin O; thus antistreptolysin O would be expected to be negative.

Group C streptococci are most frequently β-hemolytic on blood agar but γ- and α-hemolytic strains have been reported.[9] When β-hemolytic streptococci are isolated, many laboratories test for susceptibility to bacitracin to separate group A β-hemolytic streptococci, which are routinely sensitive to bacitracin, from other β-hemolytic streptococci. Of group C streptococci, however, 6% to 71% have been noted to be susceptible to bacitracin,[1] as was the organism in this case. Therefore, in most circumstances, testing of β-hemolytic streptococci for bacitracin susceptibility should not substitute for grouping of the organism by Lancefield antiserum.

Penicillin has been the primary antimicrobial for treating group C streptococcal infections in general. It appears that ampicillin, cephalothin sodium, chloramphenicol, clindamycin and vancomycin hydrochloride may be acceptable alternatives.[2,10] The issue of tolerance of group C streptococci to penicillin has been raised recently. In one study by Portnoy and co-workers,[11] 16 of 17 clinical isolates of group C streptococci showed a 32-fold or greater difference between minimal inhibitory and minimal bactericidal concentrations. Synergy between penicillin and gentamicin was found in all of the 17 strains. At some variance with this is the more recent study by Roylston and associates[10] that showed penicillin tolerance in only 2 of 26 cases. Nonetheless, in those situations wherein penicillin tolerance can be shown, the addition of an aminoglycoside may be advisable. In this case, the minimal bactericidal concentration was 0.025 μg per ml; thus, the patient was treated with penicillin without gentamicin in addition to surgical drainage to which the infection eventually responded.

S equi is one of four species of group C streptococci. Of the four, *S equisimilis* and *S zooepidemicus* are known to occasionally produce infection in humans. *Streptococcus dysgalactiae* affects cows and sheep and is a rare human pathogen. This is the second report of *S equi* infection in a human but the first of a syndrome resembling strangles.

REFERENCES

1. Stamm AM, Cobbs CG: Group C streptococcal pneumonia: Report of a fatal case and review of the literature. Rev Infect Dis 1980; 2:889-894

2. Mohr DN, Feist DJ, Washington JA, et al: Infections due to group C streptococci in man. Am J Med 1979; 66:450-456

3. Blood DC, Henderson JA: Veterinary Medicine, 2nd Ed. Baltimore, Williams & Wilkins, 1963, pp 382-389

4. Duma RJ, Weinberg AN, Medrek TF, et al: Streptococcal infections: A bacteriologic and clinical study of streptococcal bacteremia. Medicine (Baltimore) 1969; 48:87-127

5. George JL, Reif JS, Shideler RK, et al: Identification of carriers of *Streptococcus equi* in a naturally infected herd. J Am Vet Med Assoc 1983; 183:80-84

6. Srivastava SK, Barnum DA: The serological response of foals to vaccination against strangles. Can J Comp Med 1981; 45:20-25

7. Woolcock JB: Immunity to *Streptococcus equi.* Aust Vet J 1975; 51:554-559

8. Barnham M, Thornton TJ, Lange KL: Nephritis caused by *Streptococcus zooepidemicus* (Lancefield group C). Lancet 1983; 7:945-947

9. Feingold DS, Stagg NL, Kunz LJ: Extrarespiratory streptococcal infections: Importance of the various serologic groups. N Engl J Med 1966; 275:356-361

10. Roylston KV, Chandrasekar PH, LeFrock JL: Antimicrobial tolerance in group C and group G streptococci. J Antimicrob Chemother 1984; 13:389-392

11. Portnoy D, Prentis J, Richards GK: Penicillin tolerance of human isolates of group C streptococci. Antimicrob Agents Chemother 1981; 20:235-238

Myopathy From Surreptitious Ipecac Ingestion

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EMETINE HYDROCHLORIDE, the major alkaloid constituent of ipecac, has clinically recognized neuromuscular toxicity.[1-6] Acute and subacute to chronic toxic myopathies have been described, but reports of human biopsy specimens are uncommon.[2,4-6] In recent reports the reversibility of this uncommon toxic myopathy primarily in association with abuse of ipecac syrup has been emphasized.[3,4,6]

We studied the case of a 27-year-old woman with a history of progressive proximal muscle weakness and elevated muscle enzyme levels. Results of the muscle biopsy were abnormal and the specimen showed irregular inclusions in both type 1 and type 2 muscle fibers. It was later discovered that she had been surreptitiously ingesting large amounts of ipecac syrup for several months to lose weight. We review previous reports of ipecac myopathy, emphasizing the clinical features and findings on muscle biopsy. Clinicians should be alerted to this toxic myopathy, especially in young women with a possible eating disorder.

(Rosenberg NL, Ringel SP: Myopathy from surreptitious ipecac ingestion. West J Med 1986 Sep; 145:386-388)

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ABBREVIATIONS USED IN TEXT

ATPase = adenosine triphosphatase
CK = creatine kinase
NADH-TR = reduced form of nicotinamide-adenine dinucleotide-tetrazolium reductase
PAS = periodic acid Schiff

Report of a Case

Slowly progressive proximal muscle weakness developed in a 27-year-old woman, beginning in the arms and progressing to the legs. She also complained of pain and tenderness of her thigh muscles and had fallen numerous times. Evaluation two months after onset showed grade 3/5 proximal and 4/5 distal muscle weakness in both upper and lower extremities. No rash was present. The remainder of the findings of the physical examination was normal. Muscle enzyme levels were greatly elevated, including a serum creatine kinase (CK) level of 2,600 IU per liter (normal < 120). Results of all other laboratory tests were normal. A muscle biopsy specimen (Figure 1) showed moderate variation in fiber size and abundant, irregularly shaped, periodic acid-Schiff (PAS)-positive accumulations in both fiber types. There was some accompanying hyperactivity of the reduced form of nicotinamide-adenine dinucleotide-tetrazolium reductase (NADH-TR) and nonspecific esterase hyperactivity within the inclusions and occasional corresponding loss of myosin adenosine triphosphatase (ATPase). The vast majority of these cytoplasmic structures reacted darkly with the modified trichrome stain but a few were clear.

A roommate revealed that the patient had been surreptitiously ingesting large amounts of ipecac for several months to lose weight. The patient denied using the medication but made a remarkable recovery, with her CK level returning to normal over the ensuing month.

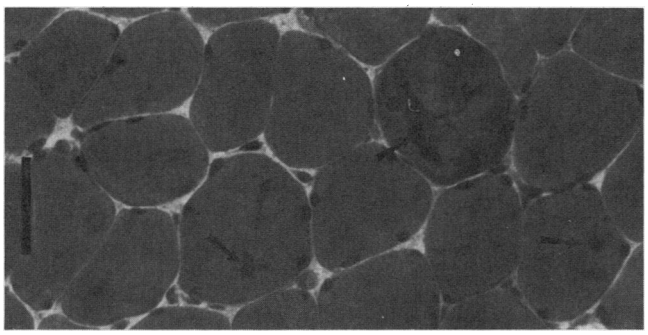

Figure 1.—A photomicrograph of a muscle biopsy specimen shows several fibers that contain irregularly shaped cytoplasmic structures (arrows). Modified trichrome stain, magnification × 86. Bar = 50 microns

Discussion

This patient—and several others in recent reports of ipecac myopathy (Table 1)—most likely was suffering from bulimia, an eating disorder usually seen in adolescent girls or young women of normal weight who may have been obese before the development of bulimic episodes. To lose weight, these women willfully vomit, often by mechanical stimulation or with the use of emetics. The historical association between ingesting ipecac and the onset of muscle weakness, together with the complete resolution of weakness without treatment other than withdrawal of ipecac, is convincing evidence for this patient's myopathy being related to the toxic effects of ipecac. There was also no associated malnutrition, connective tissue disorder or family history of any neuromuscular disorder.

In experimental models of ipecac myopathy, muscle weakness and morphologic changes in muscle are seen.[7-9] The structural changes observed in our patient's muscle biopsy specimen are identical to those of other patients with ipecac myopathy and those of experimental emetine-induced myopathy. These changes consist of focal floccular loss of myosin ATPase and NADH-TR, usually PAS-positive, occasional necrotic fibers and minimal or no cellular infiltration. The severity of muscle damage depends on the dose and duration of emetine use.[7] Neuromuscular toxicity to ipecac has been reported in the treatment of amebiasis,[1,2] aversion therapy during alcohol abuse rehabilitation[5] and in patients with eating disorders.[3,4,6]

Patients who present with muscle weakness from ipecac have predominantly proximal weakness and their disorder may clinically resemble one of the idiopathic inflammatory myopathies, polymyositis or dermatomyositis.[4] Because serum muscle enzyme levels are usually elevated in both conditions and electromyography shows a "myopathic" pattern in both, muscle biopsy may be useful in distinguishing the two disorders. Most patients with inflammatory myopathies have perivascular or endomysial pleomorphic mononuclear cell infiltrates with a predominance of lymphocytes.[10] In ipecac myopathy, however, cellular infiltration is minimal or absent (Table 1). The floccular accumulation of PAS-positive material in muscle fibers appears to be characteristic of ipecac

TABLE 1.—*Summary of Reported Cases of Emetine Myopathy*

References	Age, Years	Sex	Eating Disorder	Proximal Weakness	Muscle Enzyme Levels	EMG	Muscle Biopsy
Fewings et al, 1973[2]	30	M	No*	Yes	Increased	ND	Muscle fiber necrosis; minimal cellular response
Brotman et al, 1981[3]	18	F	Yes	Yes	Increased	Myopathic	ND
Bennett et al, 1982[4]	19	F	Yes	Yes	Normal	Myopathic	Muscle fiber necrosis; No cellular response
Sugie et al, 1984[5]	49	F	No†	Yes	Increased	ND	Floccular-shaped inclusions
	46	F	No†	Yes	Increased	ND	Floccular-shaped inclusions
Mateer et al, 1985[6]	27	F	Yes	Yes	Normal	Myopathic	Floccular-shaped inclusions
Present Case	27	F	Yes	Yes	Increased	ND	Floccular-shaped inclusions

EMG = electromyogram, ND = not done

*Treatment for amebiasis.
†Aversion therapy for alcohol addiction rehabilitation.

myopathy and not reported in cases of inflammatory myopathies. Therefore, in a patient with proximal muscle weakness and characteristic muscle biopsy abnormalities, physicians should suspect bulimia or other eating disorders associated with ipecac abuse, even when such a history is lacking.

Addendum

Since the preparation of this manuscript, two additional cases of ipecac myopathy occurring in patients with major eating disorders have been reported.[11] Muscle biopsy was done in one patient and showed isolated necrotic fibers, amorphous eosinophilic inclusions in type 1 fibers and no inflammatory response. These cases further support the notion that in patients with binge-purge eating behavior, myopathy may develop from surreptitious ingestion of ipecac and that muscle biopsy may be useful in the diagnosis.

REFERENCES

1. Klatskin G, Friedman H: Emetine toxicity in man: Studies on the nature of early toxic manifestations, their relation to the dose level, and their significance in determining safe dosage. Ann Intern Med 1948; 28:892-915

2. Fewings JD, Burns RJ, Kakulas BA: A case of acute emetine myopathy, *In* Proceedings of the Second International Congress on Muscle Diseases—II. Clinical Studies in Myology, Vol 295. Amsterdam, Excerpta Medica, 1973, pp 594-598

3. Brotman MC, Forbath N, Garfinkel PE, et al: Myopathy due to ipecac syrup poisoning in a patient with anorexia nervosa. Can Med Assoc J 1981; 125:453-454

4. Bennett HS, Spiro AJ, Pollack MA, et al: Ipecac-induced myopathy simulating dermatomyositis. Neurology (NY) 1982; 32:91-94

5. Sugie H, Russin R, Verity MA: Emetine myopathy: Two case reports with pathobiochemical analysis. Muscle Nerve 1984; 7:54-59

6. Mateer JE, Farrell BJ, Chou SSM, et al: Reversible ipecac myopathy. Arch Neurol 1985; 42:188-190

7. Duane DD, Engel AG: Emetine myopathy. Neurology (Minneap) 1970; 20:733-739

8. Bradley WG, Fewings JD, Harris JB, et al: Emetine myopathy in the rat. Br J Pharmacol 1976; 57:29-41

9. Bindoff L, Cullen MJ: Experimental (−) emetine myopathy. J Neurol Sci 1978; 39:1-15

10. Ringel SP: Inflammatory myopathies: Immunologic heterogeneity and treatment. Cardiomyology 1982; 1:51-68

11. Palmer EP, Guay AT: Reversible myopathy secondary to abuse of ipecac in patients with major eating disorders. N Engl J Med 1985; 313:1457-1459

Unintentional Thyrotoxicosis Factitia Due to a Diet Pill

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THYROTOXICOSIS due to the ingestion of excessive quantities of exogenous thyroid hormone is seen in persons who receive the medication as treatment for hypothyroidism, goiter or nodules (thyrotoxicosis medicamentosa) or in patients who ingest the hormone to reduce weight or because of personality disorders (thyrotoxicosis factitia).[1-4] Recently we saw several patients in whom thyrotoxicosis developed while ingesting a nonprescription capsule (Enzo-Caps) that was claimed to be "a natural food product of papaya, garlic and kelp" and was distributed as an adjunct for reducing weight. This medication was found to have been adulterated with thyroid hormones, which resulted in a form of thyrotoxicosis factitia developing.

ABBREVIATIONS USED IN TEXT

HPLC = high-pressure liquid chromatography
RIA = radioimmunoassay
T_3 = triiodothyronine
T_4 = thyroxine

Reports of Cases

Case 1

In 1983 the patient, a 16-year-old girl, was found to have an enlarged thyroid (approximately 1½ times normal) without symptoms of hyperthyroidism or hypothyroidism and had normal values of thyroid function tests (Table 1, Figure 1). In early May 1984 she began taking Enzo-Caps, four tablets a day, to lose weight. About two days later she awoke with palpitations and over the next two days noted weakness, fatigue, throbbing headache and a 2.3-kg (5-lb) weight loss. She was examined in mid-May and found to have a pulse of 100 beats per minute, a normal-sized thyroid and a rapid return phase of her Achilles' tendon reflex. A triiodothyronine (T_3) radioimmunoassay (RIA) showed an elevated level, and the elevated thyroid hormone levels were confirmed at a separate laboratory (Table 1). A radioactive iodine uptake was done and showed a 6-hour value of 1% (normal 4% to 18%) and a 24-hour value of 3% (normal 8% to 33%). The patient's symptoms continued and she was reevaluated in mid-July, at which time she was again found to have a tachycardia (pulse 120), rapid Achilles' reflex and elevated thyroid hormone concentrations. During the next month, she discontinued taking the Enzo-Caps, and in mid-August she was again examined. She still complained of tachycardia and tiredness but did not have any objective findings of thyrotoxicosis on examination. Thyroid function test values were at the lower range of normal at that time (presumably because of the suppressive effects of the thyroid therapy on her pituitary thyroid axis)[5] and increased to the midnormal range when she was reexamined a week later. She reported less fatigue, improved appetite, no palpitations and was found to have a pulse of 68 and normal ankle jerks.

Case 2

This patient, the 48-year-old mother of patient 1, had received various thyroid medications in the past for "low metabolism." In 1983 she complained of fatigue and was convinced that her metabolism was abnormal. She requested thyroid hormones but her request was denied after her thyroid hormone levels were found to be normal (Table 1). At some time during the next year she began taking Enzo-Caps. She did not have any symptoms suggestive of hyperthyroidism. She accompanied her daughter to the physician's office on August 24, 1984, at which time she requested that thyroid function tests be done. A pronounced elevation in T_3 level on RIA was noted (Table 1). The patient refused further evaluation but followed medical advice to discontinue taking the

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